

Claims

WHAT IS CLAIMED IS:

1. A method comprising:

computing a stereo disparity surface between a first image and a second image of a stereo image pair;

computing an integer position on a virtual image plane from a projection between the virtual image plane and a center of projection through a projected point on the stereo disparity surface to the virtual image plane; and

setting a pixel value of the integer position on the virtual image plane based on the projected point on the stereo disparity surface.

2. The method of claim 1 wherein the setting operation comprises:

setting the pixel value of the integer position on the virtual image plane as a weighted average of pixel values from integer positions of the first and second images that correspond with the projected point on the stereo disparity surface, if the integer positions of the first and second images that correspond with the projected point on the stereo disparity surface are not occluded.

3. The method of claim 1 wherein the setting operation comprises:

setting the pixel value of the integer position on the virtual image plane to a pixel value from one or more integer positions of the first image that corresponds with the projected point on the stereo disparity surface, if one or more integer positions of the second image that corresponds with the projected point on the stereo disparity surface are occluded.

4. The method of claim 1 wherein the center of projection is translatable in a plane parallel to the virtual image plane.

5. The method of claim 1 wherein the center of projection is translatable along a normal axis from the virtual image plane.

6. The method of claim 1 wherein the center of projection maps to a virtual camera position.

7. The method of claim 1 wherein the operation of computing an integer position on the virtual image plane comprises:

applying a projection matrix to a centered point in the virtual image plane to determine the location of the point on the virtual image plane.

8. The method of claim 1 wherein the operation of computing an integer position on the virtual image plane comprises:

projecting the center of projection through the projected point on the stereo disparity surface to the virtual image plane.

9. The method of claim 1 wherein the operation of computing an integer position on the virtual image plane comprises:

projecting the center of projection the projected point on the stereo disparity surface to the virtual image plane, the projected point being at an integer position on the stereo disparity surface.

10. The method of claim 1 wherein the operation of computing an integer position on the virtual image plane comprises:

projecting the center of projection through the projected point on the stereo disparity surface to a floating point position on the virtual image plane; and

projecting an integer position on the virtual image plane to identify the projected point on the stereo disparity surface, the integer position being adjacent to the floating point position on the virtual image plane.

11. The method of claim 1 wherein the setting operation comprises:

setting the pixel value associated with the integer position on the virtual image plane to a pixel value computed as a bilinear interpolation of pixel values from integer positions on the first and second images, each integer pixel position being corresponding to the integer position on the virtual image plane through an inverse mapping point on the stereo disparity surface.

12. The method of claim 1 wherein the setting operation comprises:

setting the pixel value associated with the integer position on the virtual image plane to a pixel value computed as a bilinear interpolation of pixel values from integer positions on the first image, each integer pixel position being corresponding to the integer position on the virtual image plane through an inverse mapping point on the stereo disparity surface.

13. A computer program product encoding a computer program for executing on a computer system a computer process, the computer process comprising:

computing a stereo disparity surface between a first image and a second image of a stereo image pair;

computing an integer position on a virtual image plane from a projection between the virtual image plane and a center of projection through a projected point on the stereo disparity surface to the virtual image plane; and

setting a pixel value of the integer position on the virtual image plane based on the projected point on the stereo disparity surface.

14. The computer program product of claim 13 wherein the setting operation comprises:

setting the pixel value of the integer position on the virtual image plane as a weighted average of pixel values from integer positions of the first and second images that correspond with the projected point on the stereo disparity surface, if the integer positions of the first and second images that correspond with the projected point on the stereo disparity surface are not occluded.

15. The computer program product of claim 13 wherein the setting operation comprises:

setting the pixel value of the integer position on the virtual image plane to a pixel value from one or more integer positions of the first image that corresponds with the projected point on the stereo disparity surface, if one or more integer

positions of the second image that corresponds with the projected point on the stereo disparity surface are occluded.

16. The computer program product of claim 13 wherein the center of projection is translatable in a plane parallel to the virtual image plane.

17. The computer program product of claim 13 wherein the center of projection is translatable along a normal axis from the virtual image plane.

18. The computer program product of claim 13 wherein the center of projection maps to a virtual camera position.

19. The computer program product of claim 13 wherein the operation of computing an integer position on the virtual image plane comprises:

applying a projection matrix to a centered point in the virtual image plane to determine the location of the point on the virtual image plane.

20. The computer program product of claim 13 wherein the operation of computing an integer position on the virtual image plane comprises:

projecting the center of projection through the projected point on the stereo disparity surface to the virtual image plane.

21. The computer program product of claim 13 wherein the operation of computing an integer position on the virtual image plane comprises:

projecting the center of projection the projected point on the stereo disparity surface to the virtual image plane, the projected point being at an integer position on the stereo disparity surface.

22. The computer program product of claim 13 wherein the operation of computing an integer position on the virtual image plane comprises:

projecting the center of projection through the projected point on the stereo disparity surface to a floating point position on the virtual image plane; and

projecting an integer position on the virtual image plane to identify the projected point on the stereo disparity surface, the integer position being adjacent to the floating point position on the virtual image plane.

23. The computer program product of claim 13 wherein the setting operation comprises:

setting the pixel value associated with the integer position on the virtual image plane to a pixel value computed as a bilinear interpolation of pixel values from integer positions on the first and second images, each integer pixel position being corresponding to the integer position on the virtual image plane through an inverse mapping point on the stereo disparity surface.

24. The computer program product of claim 13 wherein the setting operation comprises:

setting the pixel value associated with the integer position on the virtual image plane to a pixel value computed as a bilinear interpolation of pixel values from integer positions on the first image, each integer pixel position being corresponding to the integer position on the virtual image plane through an inverse mapping point on the stereo disparity surface.

25. A system comprising:

a dynamic programming module computing a stereo disparity surface between a first image and a second image of a stereo image pair;

a virtual camera translation module computing an integer position on a virtual image plane from a projection between the virtual image plane and a center of projection through a projected point on the stereo disparity surface to the virtual image plane; and

a cyclopean virtual image generator setting a pixel value of the integer position on the virtual image plane based on the projected point on the stereo disparity surface.

26. The system of claim 25 wherein the cyclopean virtual image generator sets the pixel value of the integer position on the virtual image plane as a weighted average of pixel values from integer positions of the first and second images that correspond with the projected point on the stereo disparity surface, if the integer positions of the first and second images that correspond with the projected point on the stereo disparity surface are not occluded.

27. The system of claim 25 wherein the cyclopean virtual image generator sets the pixel value of the integer position on the virtual image plane to a pixel value from one or more integer positions of the first image that corresponds with the projected point on the stereo disparity surface, if one or more integer positions of the second image that corresponds with the projected point on the stereo disparity surface are occluded.

28. The system of claim 25 wherein the center of projection is translatable in a plane parallel to the virtual image plane.

29. The system of claim 25 wherein the center of projection is translatable along a normal axis from the virtual image plane.

30. The system of claim 25 wherein the center of projection maps to a virtual camera position.

31. The system of claim 25 wherein the virtual camera translation module applies a projection matrix to a centered point in the virtual image plane to determine the location of the point on the virtual image plane.

32. The system of claim 25 wherein the virtual camera translation module projects the center of projection through the projected point on the stereo disparity surface to the virtual image plane.

33. The system of claim 25 wherein the virtual camera translation module projects the center of projection the projected point on the stereo disparity surface to the virtual image plane, the projected point being at an integer position on the stereo disparity surface.

34. The system of claim 25 wherein the virtual camera translation module projects the center of projection through the projected point on the stereo disparity surface to a floating point position on the virtual image plane, and projects an integer position on the virtual image plane to identify the projected point on the stereo disparity surface, the integer position being adjacent to the floating point position on the virtual image plane.

35. The system of claim 25 wherein the setting operation comprises:

setting the pixel value associated with the integer position on the virtual image plane to a pixel value computed as a bilinear interpolation of pixel values from integer positions on the first and second images, each integer pixel position being corresponding to the integer position on the virtual image plane through an inverse mapping point on the stereo disparity surface.

36. The system of claim 25 wherein the cyclopean virtual image generator sets the pixel value associated with the integer position on the virtual image plane to a pixel value computed as a bilinear interpolation of pixel values from integer positions on the first image, each integer pixel position being corresponding to the integer position on the virtual image plane through an inverse mapping point on the stereo disparity surface.

37. A method comprising:

generating a virtual image from a first image and a second image of a stereo camera pair, the virtual image being projected from an optical center of a virtual camera, the virtual camera being translatable with respect to the stereo camera pair.

38. A computer program product encoding a computer program for executing on a computer system a computer process, the computer process comprising:

generating a virtual image from a first image and a second image of a stereo camera pair, the virtual image being projected from an optical center of a virtual camera, the virtual camera being translatable with respect to the stereo camera pair.

39. A system comprising:

a cyclopean virtual image generator creating a virtual image from a first image and a second image of a stereo camera pair, the virtual image being projected from an optical center of a virtual camera, the virtual camera being translatable with respect to the stereo camera pair.